

UNIVERSITI TEKNOLOGI MARA

**OPTIMISATION OF THE
STERILISATION PROCESS OF OIL
PALM FRUITS**

JUNAIDAH BINTI MAT JUSOH

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

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Name of Student	:	Junaidah bt Mat Jusoh
Student ID No.	:	2009801956
Programme	:	Food Technology (AS 780)
Faculty	:	Applied Sciences
Thesis Title	:	Optimisation of The Sterilisation Process of Oil Palm Fruits
Signature of Student	: 
Date	:	March 2015

ABSTRACT

Extracting high quality Crude Palm Oil (CPO) from optimised sterilisation process might provide solution for insufficient supply's issue of the oil. The study was performed by using different degree of Fresh Fruit Bunch (FFB) ripeness and loose fruits. Response Surface Methodology (RSM) approach was applied, based on the interrelation between process temperature (X_1 ; 100 to 120°C), time (X_2 ; 20 to 80 min), and CPO quality parameters (Y_1 , Free Fatty Acid (FFA); Y_2 , Peroxide Value (PV); Y_3 , Deterioration of Bleachability Index (DOBI); and Y_4 , carotene content). FFA was recorded increases as the FFB ripen. Though there was no apparent PV difference noticed at underripe, ripe and overripe FFB, substantial increment was recorded on loose fruits. No specific patterns observed for both DOBI and carotene content. Sixteen polynomial models were developed with models' significance at $p < 0.05$ and R^2 approximating 1. There was a strong effect of temperature on FFA, as X_1 were found highly significant at all degree of ripeness. Process time was found more pronounced influencing the PV from underripe and ripe FFB and the role was dominated by temperature as the maturity increases. Stronger effect of time recorded on DOBI, with $p < 0.0001$ (underripe, ripe and overripe FFB) and $p = 0.0077$ (loose fruits). For carotene content, both temperature and time were mutually responsible on carotene destruction at any degree of ripeness. Optimum sterilisation conditions were determined and verified. Both underripe and ripe FFB show potential for extracting Premium Quality CPO at 100°C and 20min while overripe FFB is suitable for extraction of Special Quality CPO at 111.3°C and 36.52min. Palm oil producers should consider for segregating the FFB according to ripeness, instead of simply mixing up the received crop for processing. The extraction of high quality CPO from different degree of FFB ripeness is feasible as long as the right combination of sterilisation process heating parameters employed.

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